business topics

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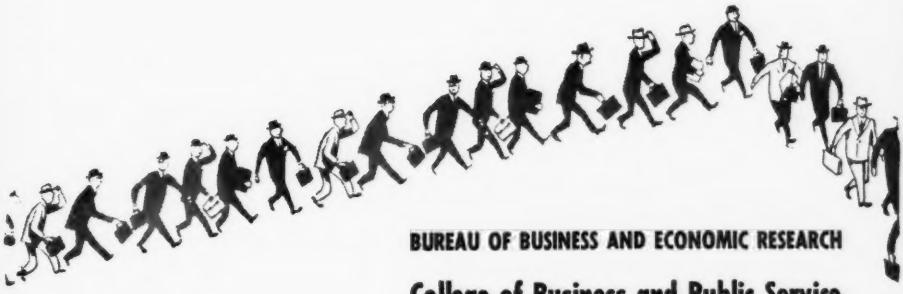

BUREAU OF BUSINESS AND ECONOMIC RESEARCH
College of Business and Public Service
MICHIGAN STATE UNIVERSITY
EAST LANSING

Associated University Bureaus of Business and Economic Research

11th Annual Meeting, October 2-4, 1957

From among the hundreds of professional conferences that take place at Kellogg Center on this campus each year, we are glad to take special notice of one to which this Bureau played host. It was the gathering of the Associated University Bureaus of Business and Economic Research, or AUBBER, as it is known: a national organization of over 50 bureaus such as our own. 36 of the members, from Oregon and Washington to Virginia and Alabama, were represented at the three-day meeting.

Bureaus of this nature constitute a fairly recent development, designed as they are to serve as liaison between a particular institution and the business public it serves. Only one of them, at the Wharton School of Economics and Finance of the University of Pennsylvania, dates from before the present century: it was founded in 1881. One other, that at Harvard, was started in 1906. It was the impetus of the depression, and later that of wartime emergencies, that made research of this nature, and the concomitant public service it implies, logical developments for colleges of business.

In such a rapidly expanding field, annual nation-wide meetings are of particular importance. Exchange of theories, ideas and techniques is not only engrossing but vital. The conference included panel discussions on editorial policies (which turned out to be extremely varied), on the nature of economic developmental research that may appropriately be undertaken, and on the organization of a bureau for maximum effectiveness.

business topics

Vol. 5 November, 1957 No. 3

"Let your discourse with men of business be short and comprehensive."

(George Washington's *Copybook*).

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Conferences Past and Future

Continuing education is a prime concern of this institution, in accordance with its philosophy of service to the entire state. The following, of especial interest to business readers, are among conferences that have been, or are, scheduled at Kellogg Center for Continuing Education, which acts as co-sponsor of the meetings. For information on conferences outside the College of Business and Public Service, write the Continuing Education Service, MSU. For those sponsored by any department of the College itself, write Dr. Paul Smith, Assistant Dean for Continuing Education, College of Business and Public Service, MSU.

Seventh Annual Management Conference,
sponsored by the Management Clubs of Michigan
October 5, 1957

JETS (Junior Engineering Training for Schools) Leadership Conference,
H. P. Skamser, Director
sponsored by the College of Engineering
October 5, 1957

Fundamentals of Industrial Supervision: a practical program in foreman training
sponsored by the College of Business and Public Service
October 7, 1957
March 3, 1958
April 28, 1958

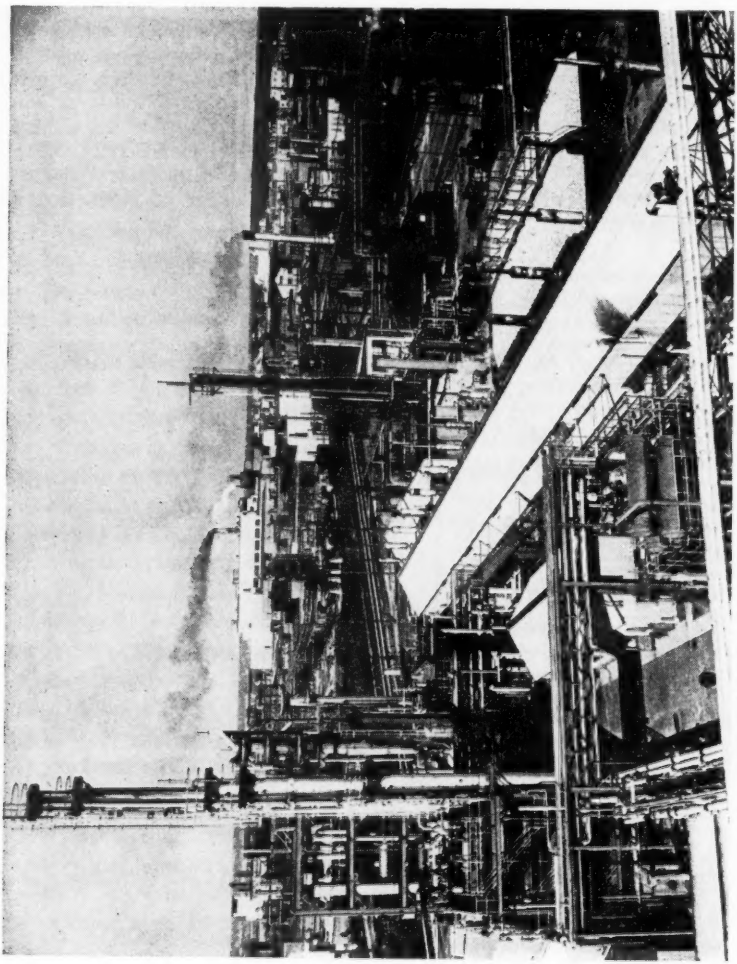
Planning a Community College
sponsored by the Department of Public Instruction
October 25, 1957

Small Business Conference
Sponsored by the Michigan Federation of Business and Professional Women's Clubs and the College of Business and Public Service
November 2-3, 1957

Purchasing Seminar: education in industrial purchasing for business personnel
sponsored by Purchasing Agents Association of Central Michigan and the College of Business and Public Service
November 18-22, 1957
December 2-6, 1957

Insurance Management Seminar
sponsored by the College of Business and Public Service
March 31 - April 4, 1958
August 25-29, 1958

See also the inside covers of this issue.



General view of the Dow plant, with the hypersorber at the left.

PIONEERING IN INDUSTRIAL CHEMISTRY: The Dow Story

*By ANNE C. GARRISON**

One of the most engrossing aspects of Michigan's industrial picture is the epoch-making chemical research and production centered around the pastoral Tittabawassee. The Dow Chemical Company is the subject of the latest in our series of industrial-geographic articles.

In a softly-lighted workshop flames sprout from gas jets like gladioli, and molten glass tubes, slowly revolving to the skillful blowing of master workmen, take on fantastic shapes. They evolve into complications of spiral within spiral, column within column. Here in the heart of Michigan one of the oldest and most versatile of crafts is being carried on by men who have learned their trade in the age-old way, first as apprentices, then journeymen, then masters. A Venetian of the Middle Ages, an Egyptian of the ancient world, would have understood the techniques used, and have marvelled at the skill, but the uses of these fractionating and distilling columns would have baffled them.

What part does this time-honored craft play in the incredible picture of modern chemical production that surrounds the workshop? Step outside it and you are in the midst of the country's largest single chemical industrial plant within one enclosure: close to 1,000 acres are here covered with production plants, filtration beds, a 200-mile network of overhead piping and more pipe underground than anyone has ever calculated. This is the home plant of The Dow Chemical Company on the bank of the Tittabawassee River, in Midland: one of Michigan's most famous industrial landmarks, and the site from which the familiar diamond-shaped trademark first went out, to become recognized in every country in the world. Why the paradox of handicraft in this enterprise that helped pioneer the age of modern chemistry?

Many Paradoxes

One way to view the Dow operation is as the sum total of many bewildering paradoxes. Glass-blowing in an ultra-modern industry would seem to typify the contradictory aspects of the picture in Midland. Yet the reason for its presence is a very practical one, for nothing exists in the plant because of a curator-like desire to keep part of the past inviolate. Glass-blowing is actively employed next door to the most advanced techniques, for very good reasons: complicated laboratory procedures call for complicated glass apparatus that can be more expeditiously provided right on the spot; hence this island of handicraft in an engulfing sea of industrial chemistry.

It will be recalled that the whole economic development of Michigan is fraught with paradox. We have seen over and over again in this series of articles that the diversified basis of prosperity in our state—industry, agriculture, tourism—came about through various efforts to recover from the wasting sickness of an area looted of its forests. Some communities turned to fruit growing, some to vacation and railroad promotion, some to salt refining. Out of bankruptcy evolved a new economy.

Another paradox: the Dow enterprise began in salt, and owes its success to the fact that local salt was less pure than that on the west and east lake shores (as for instance at Montague and St. Clair

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Shores):[1] it was mixed with bromides and magnesium salts. The bromide content attracted the attention of an inventive young graduate of Case Institute of Applied Science in Cleveland. Herbert H. Dow had first visited Midland in 1888 while collecting samples from various sources for a thesis he was writing on brine chemistry. The story of his firm's development, in a nutshell, is a constant endeavor to make full use of *all* the impurities. The most recalcitrant of these, magnesium, was the last to be put to large-scale use. Today the demand for Dow's magnesium alloy metals is such that the raw product is made of seawater in Texas rather than brine in Michigan, but the process is essentially the same.

Dr. Dow, eventually holder of two honorary degrees (Case and the University of Michigan) and recipient of chemistry's most coveted award, the Perkin Medal, was himself a most paradoxical figure. Son of an inventor, he wanted to study architecture, but lack of funds led him to accept the only scholarship he found open, and his training at Case was to direct his interests into many fields of applied science. As one studies the life of this greatly gifted man, it is interesting to speculate on the impact his talents might have had upon modern architecture. Concern for experimental use of materials, belief in functional form and economy of means, refusal to accept conventional solutions to problems: all these traits he had in common with the best modern architects. They were to find expression in a different kind of building, that of a mighty chemical organization.[2] His original aspirations were fulfilled in his distinguished son, Alden Dow, whose genius has had so much effect upon contemporary architecture.

[1]See "Montague: Michigan's $30,000,000 Electrochemical Industry of the Future", *Business Topics*, June, 1954; and "Montague: The Future Is Now", *Business Topics*, July, 1956, by Anne C. Garrison.

[2]See Murray, Campbell and Harrison Hatton's excellent biography, *Herbert H. Dow, Pioneer in Creative Chemistry* (New York: Appleton-Century Crofts, Inc., 1951).

The craft of the past: one of Dow's master glassblowers creates an intricate piece of laboratory equipment.

Using Up The Chips

It was 1890 when the young chemist moved to Midland, then a fairly unprosperous town of 2,000 that sustained itself on a sporadic brine industry, evaporation of salt from the local wells by means of fires stoked with the abundant scrap lumber left from the mills. Already Midland was the biggest producer of bromides in the world—not too large a claim, at that, for though bromides had been chemical commodities (mostly for patent medicines) for many years, total production was small. It was Dow's conviction that bromides could be produced cheaper and better than by the usual evaporation process which wastefully recovered sodium chloride—or common salt—before the bromides. In the very first operation he undertook, Dow struck the paradoxical note characteristic of his enterprises: local labor and the cheapest available materials were constantly employed; on the other hand, when novel or undreamed-of machinery was necessary, no cost and no amount of preliminary research were allowed to stand in the way of obtaining

it. He built his revolutionary electrolytic cells from reject lumber and culled-out carbon pencils rejected by arc-light manufacturers; yet he besieged Westinghouse Electric to build him a generator beyond the power of the industry to construct. He himself designed it, and for several years the electrical firm retained his services as a consultant for other such designs.

Midland was using up its chips to charge the fires under the evaporating pans, and for years Dr. Dow was to use up chips too: valuable blue chips of hard-to-come-by capital. Paradox again: the attempt to pioneer in industrial chemistry by methods later proved the most practical won him a reputation for impracticality so that he was often in a position of having to struggle with his backers to be allowed to do things his way. One of these men was later to say, "He made our fortunes in spite of ourselves". Explosions, failures of experiments, loss of money and of some financial backing bedevilled the early years of the company. Over and over again, Dr. Dow's convictions turned out to be the right ones; in his keeping constantly at research into new uses for brine chemicals (150 products of Midland brine were to be evolved in the early years) in his "visionary" ventures into agricultural experimentation, to result, decades later, in large-scale industrial chemistry beneficial to the farmer; in his concern for a supply of synthetic rubber and light structural metal.

The Great Price Wars

It would obviously be impossible to treat the entire history of the Dow Chemical Company, but however short our account, it should be noted that the strongly individualistic cast of the founder's mind was reflected in a strongly individualistic type of company. All too often genius cramps those in contact with it: the dead hand of a founder rests upon a firm, a factory or a school, and a man of vision is memorialized by a static structure rather than the dynamic one he first projected. Such has never been the case with the Midland company. It reveals today, in the face of chemical developments even the founder could hardly have envisaged, the same initiative, daring and individualism that signalized his own activities.

If Dr. Dow had done nothing else memorable as inventor and executive, he would be of great importance in the history of American industrial chemistry as the man who broke, almost single handed, the stranglehold of the German and English firms upon the international market for certain commodities. Scarcely five years after he started his business he was seeking backers for a project that would furnish domestic bleach for the rapidly-growing textile and newsprint industries. At the time, English bleach dominated the American market, and Dow, stubborn as well as inventive, lost some $90,000 in one year in a successful attempt to provide Michigan paper mills with a cheaper bleach than the English one. As a result, Dow today produces one third of all the chlorine gas in the country, putting 95% of this back into its own processes. The price war over a few carloads of bleach may seem ancient history, but without the sort of stand Herbert Dow made, his company, and perhaps the whole chemical industry in America, would not have fought clear of foreign domination.

This bleach war with England was matched by an even more significant struggle to break the hold of the German cartels upon the manufacture of bromides. By 1909 the company had undercut the market for German bromides in this country and had proved that it could also compete in the international market. Experiences like this were to prove of great value when the first World War cut us off from German dyestuffs and other chemicals.

Too Many Fields?

Such were the difficulties American industrial chemistry had to surmount. It is well the contest came when it did, with two great conflicts ahead and the world's most highly developed chemical research

facilities at the service of the enemy. Even by 1910 the Dow company was exhibiting the pattern of production and research that has signalized its work ever since: constant effort to lower prices of chemicals already on the market; constant search for new uses for familiar products and new products to satisfy long-standing needs. In the words of his biographers:

> . . . now he was spending time and whatever money he could get in order to look for products which did not yet exist, or which were known to exist but to have no immediate commercial use. . . . He was making the chemical factory a creative place —a place where new products useful to people were thought up and made.[3]

Research in chemistry, by the end of the first World War, had taken Dow into such long-range projects as the development of synthetic rubber,[4] synthetic indigo dye and synthetic phenol—the last-named an important "work-horse" chemical of today. Metallic magnesium from the inexhaustible brine wells also dates from this period. Even if the practical ends had not been attained completely — nor can they ever be in so experimental a field — the attitude of mind that orients chemistry toward imaginative research was nurtured by men like Dr. Dow. Those who carry on the industry today acquired their mixture of practical administrative skill, freedom to attack new ventures, and stubborn determination to make them economically rewarding, from the stresses of the years of growth and struggle.

When the second World War threw American industrial chemistry into supplying the government with sorely needed materials, notably plastics, synthetic rubber and magnesium, the Dow Company had the only commercial production of styrene and delivered the first tank car of butadiene: these products are the two major components of synthetic rubber. Both are basic materials for plastics. At that time Dow also built and operated for the government two huge magnesium plants (the only ones then in operation) and two large styrene plants. Dr. Dow had died in 1930; the crucial part his firm played in supplying critical materials was to vindicate him completely in the eyes of any critics who might still have felt that the firm was engaged in just too many fields at once.

An End and A Beginning

Shortly before his death, Dr. Dow had received "industrial chemistry's Nobel Prize", the Perkin Medal. An associate of long standing summarized his accomplishments, on this occasion, as having included the following:

- the introduction of cheap phenol
- the creation of a steady domestic source of metallic magnesium
- the breaking of several foreign monopolies
- the development of carbon tetrachloride
- the development of chlorine as a cheap and widely available processing material
- the development of many scores of new uses for bromine

All these efforts added up, by 1930, to an aggregate of projects that turned out 800 freight car loads a month of over 150 different chemical products. Yet the attitude of aggressive attack upon chemical problems was an inheritance, for the Dow company, of greater ultimate importance than the sum of the founder's accomplishments. Three American industrial chemical companies are larger than the Midland firm; it is the fastest growing of them all. Growth continues at such a phenomenal rate of recent years that total dollar output of all Dow enterprises today is over 10 times what it was at the founder's death. Over 600 products are made in the Midland plant alone, and every month turns up new ones.

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[3]Campbell and Hatton, op. cit., p. 82.

[4]A dispirited note in his handwriting in a 1909 lab report reads: "These substitutes altho good at first after standing in a warm room for a few days become very soft and sticky".

Industrial chemistry is still so new that there are no yardsticks to measure its growth. As we turn to examine some aspects of the Dow company today, let us admire the retaining of the personal contact between management and employees, a respect for the individual, that has always gone hand in hand with the firm's own individualism. Though 12,000 of Dow's total of 27,000 employees work in the Midland area, there is still a friendly familiar basis of contact not always achieved in industry. The Midland plant has had only one strike in its history. Dow has never gone in for the organizational chart and efficiency study type of operation. The company management is located in Midland, and decisions affecting international operations can be reached in a matter of hours by face-to-face conferences. In the words of one of the Vice Presidents of the firm: "When we get so big we can't run the company on this person-to-person basis any longer, we'll know we're too big."

Dow Today

In surveying the company's present scope, we must keep in mind that Midland is now the center of world-wide activities. By the end of the fiscal year, Dow expects to have $1 billion invested in plants. Its sales for fiscal 1957 were $628 million. About 4% of sales revenue, on the average, is invested in research: a large factor in its rate of expansion, for the chemical industry involves enormous per capita expenditure, and research is vitally necessary to keep this investment a paying one. There follows a roll-call of many of the activities with which the company is involved:

Dow Operations[5]

Midland, Michigan — chemicals, plastics
Bay City, Michigan — magnesium foundry and fabrication
Bay City, Michigan (under construction) — chemicals, plastics
Ludington, Michigan — chemicals
Freeport, Texas — chemicals, magnesium, plastics
Pittsburg, California — chemicals
Torrance, California — plastics
Allyn's Point, Connecticut — plastics
Madison, Illinois — magnesium alloys, sheet and extrusions
Rocky Flats, Colorado — manufacturing for Atomic Energy Commission
Seal Beach, California — iodine
Framingham, Massachusetts — chelating compounds
Houston, Texas — Brazos Oil and Gas Co. (division of Dow) — development of resources for Dow
Ironton, Ohio — Hanging Rock Plant — plastics
Pevely, Missouri — Riverside Plant — plastics
Plaquemine, Louisiana (under construction) — chemicals
Lee Hall, Virginia (under construction) — staple fiber (Zefran)
Cleveland, Ohio — The Dobeckmun Company (division of Dow) — Plants in Cleveland, Ohio, Berkeley, Calif. — flexible packaging, industrial laminates, and metallic yarns

Subsidiary Companies

Adams Paper Company, Wells River, Vt. — gift wrapping tissue
Bay Pipe Line Corporation, Bay City, Michigan — transportation of crude oil in Michigan
Bay Refining Corporation, Bay City, Michigan — products of petroleum refining
Ben-Mont Papers, Inc., Bennington, Vermont — gift wrapping materials
Cliffs Dow Chemical Company, Marquette, Mich. (66⅔% owned by Dow) — charcoal and hardwood distillation products
Dobeckmun Britain, Limited, Windsor, England — metallic yarns
Dobeckmun Europa, N. V., Amsterdam, The Netherlands — Metallic yarns
Dobeckmun de Mexico, S. A. de C. V., Mexico City — sale of metallic yarns
Dow Chemical of Canada, Limited, Toronto and Sarnia, Ontario — chemicals, plastics
Dowell Incorporated, Tulsa, Oklahoma — oil well treating and industrial acidizing
Dow Chemical Inter-American Limited and
Dow Chemical International Limited — Midland, Mich. — foreign sales
Dow Quimica Argentina, S. A., Buenos Aires, Argentina — holding company

[5]Subsidiary companies are more than ½ owned; associated ones are ½ or less.

for investments in Argentina
Dow Quimica do Brasil, S. A., Sao Paulo, Brazil — sale of Dow products in Brazil
LaDomincia, S. A. de C. V., Mexico City, Mexico — development of fluorspar deposits in state of Coahuila
Nederlandsche Dow Maatschappij, N. V., Rotterdam, The Netherlands —manufacture, import and distribute chemicals, plastics and magnesium
United Oilwell Service, S. A., Caracas, Venezuela (61% owned subsidiary of Dowell Incorporated) — servicing oil and gas wells and industrial equipment

Domestic Associated Companies

Dow Corning Corporation, Midland, Michigan — silicone products
Ethyl-Dow Chemical Company, Freeport, Texas — ethylene dibromide
The Saran Yarns Company — Odenton, Maryland — saran fine fibers

Foreign Associated Companies

Asahi-Dow Limited, Suzuka City, Kawasaki, and Nobeoka, Japan (owned jointly by Dow Chemical International Limited and The Asahi Chemical Industry Company Limited) — plastics
Distrene Limited, Barry, South Wales (owned jointly by Dow and The Distillers Company Limited, Dow having a 45% interest) — plastics
Polychem Limited, Bombay, India (Dow has one-quarter interest) — plastics
Pyrina S. A., Mexico City, Mexico (Dow has one-half interest) — pharmaceutical products
Productos Quimicos Mexicanos S. A., Mexico City, Mexico (Dow owns 50% interest) — chlorine, caustic soda
Sales y Alcalis, S. A., State of Vera Cruz, Mexico (Dow owns 50% interest) — future manufacture of caustic soda and other alkali derivatives, chlorine and related products.

This impressive enumeration represents very recent growth, for until 1938, when a west-coast operation was obtained, activity centered around Midland. The home plant is still the largest of all the chemical plants in the country, and the one in Freeport, Texas, opened in 1939-40 to manufacture magnesium from sea water, is the second largest and now produces numerous industrial chemicals as well as magnesium. Much of its magnesium output goes by barge up the Mississippi River to Madison, Illinois, where it is handled by the world's largest magnesium extrusion and rolling mill. No doubt the list of activities will prove obsolete by the time of this article's appearance. To round out the sum, we should add the two chartered vessels, *Marine Dow Chem* and *Marine Chemist*, of the 18,000 and 12,500 ton classes respectively, that are equipped to handle liquid and dry chemical transportation. A third chartered vessel of the 18,000 ton class will be launched in 1959.

Here is a breathtakingly wide scope of activities, ranging from a large part of the nation's material for aspirin tablets to acids for treating oil and gas wells to increase their production.

At the present time one third of Dow sales is in plastics and one tenth in magnesium. Both these activities are forging ahead rapidly, plastics the fastest of all Dow products, with the Styron family in the lead. Magnesium follows a 20% annual growth curve analogous to that of aluminum 20 years ago. A stunning recent practical application of a Dow magnesium alloy is Shwayder Brothers' Ultralite luggage, made of formed magnesium sheet covered with vinyl plastic and with ends of tough Ethocel plastic, the finished product thus employing more than one Dow product in its construction.

A Survey of the Midland Plant

Since we cannot hope to touch upon more than a very small part of Dow's total operations, let us confine ourselves to the Midland plant. Due to its location, it can ship out either directly by rail or by boat from its docking facilities in the Bay City area. When the St. Lawrence Seaway is open it will enable Dow to ship chemicals directly from Midland to all parts of the world, in many instances eliminating a rail haul to New York and the additional handling. Deepening of the channel of the Tittabawassee River, which flows all along one side of the Midland plant, could conceivably

Dow's magnesium sheet forms the core of this vinyl-covered Ultralite Samsonite luggage; the ends and handle are of Dow's Ethocel plastic.

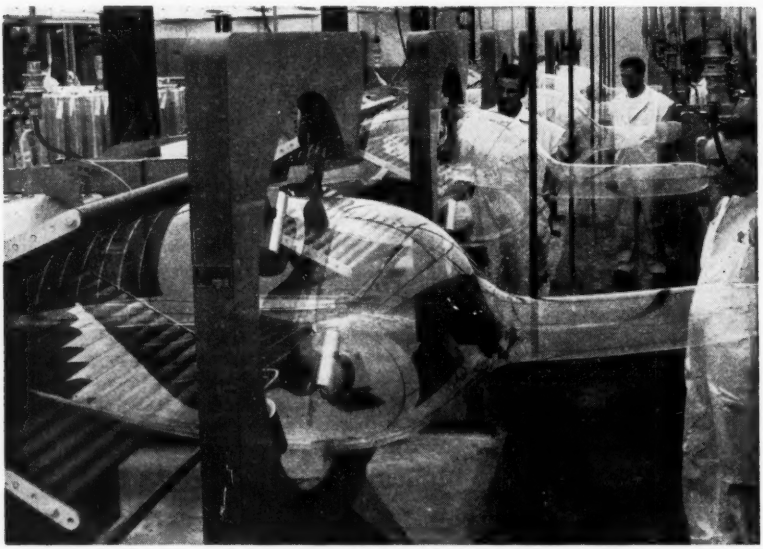
make it possible to bring barges all the way up to Midland—this project is only in the gleam-in-the-eye category so far, however. The pastoral Tittabawassee even now is of great economic usefulness, for its entire volume passes through various plant processes not once, but *three times* in every twenty-four hour period: 200 million gallons a day, of which over one third needs cleaning treatment before return to the river. The largest private water disposal plant in the country handles this problem of purification, returning the water cleaner than it is received.

In addition to the river water, 10 million gallons per day are piped from Lake Huron through 65 miles of line, with the cities of Saginaw and Midland cooperating in the great venture. As for electricity, the 125,000 kwh's constantly generated would suffice to serve *all* the needs of a city the size of Lansing; the largest of the several power houses consumes 80 tons of coal per hour. 35 to 40 miles of private railroad track serve the 1,000 acres that the plant covers. Dominating the panoramic view of this area is the tremendous tower, the hypersorber, which is the largest set structure in Michigan ever put up in one piece. Among the welter of buildings is Dow's original Brine Well #1, pumping as steadily as it did 60 years ago.

Floats and Films

So many and varied are the products of this area that they may cost from a penny a pound all the way to $100. Some are chemicals and products that go into many final uses. Finished products include solvents and agricultural chemicals. Among plastics you are likely to have encountered in the form Dow gave them are two of the most interesting the company makes: Styrofoam and saran. The former is a polystyrene plastic, expanded by a secret process to a multicellular board four times lighter than cork. It was developed during the last war as a filling material for channel buoys; Dow's ingenuity made the heavy cans unsinkable no matter how many bullets were pumped into them by German submarines. Peacetime uses for Styrofoam board in commercial storage, residential and appliance insulation, buoyancy panels for boats and decorations for the home or the florist indicate the wideness of its usefulness. Scraps are handy for deer hunting or ice fishing: fine to stand or sit on in zero weather. A 6′ by 3′ piece will make a good play raft. All in all a fascinating material, so much in demand that five Dow plants in this country now turn it out. Twenty years ago it was unknown.

Saran, in the form of seat covers, window screens and textile filaments is another fascinating plastic: the wide field of applicability of these two products alone is some indication of what plastics can do today. The engrossing process that forms Saran Wrap reminds the visitor of the glass workshop described earlier. Saran is blown up into a bubble of plastic much the way heated glass is blown into bubbles and tubes. Starting as a powder (the product of petroleum



A tube of extruded molten Saran polymer is blown into a bubble of film during the making of Dow's Saran Wrap. (Courtesy of Rotkin, P.F.I.)

gas and brine), the heated, liquefied material is fed slowly out of a machine, to encounter and surround a stream of air, which forms it into a continuous tube: this, flattened, dried and cut, is sold in rolls or sheets for those uses in home freezing and wrapping familiar to all homemakers. New applications are constantly being found for this product, as for so many other plastics. It would be safe to say that of all the memorable sights a visitor carries away with him from the plant, the making of the three light and lyrical materials—glass devices, Saran and Styrofoam—will linger with him longest.

Conclusion

At this point the writer pauses, realizing the importance of all that remains unsaid: the influence of the founder and the firm upon the town's development; the distinguished architecture of Alden Dow and others, which figures largely in the town's unique appearance; the singular beauty of the community as a whole. A model recreation program centered in a fine new community center serves all age groups, while church, library and hospital facilities impress observers from all over the world with the fact that Midland is one of the most distinctive communities in existence. One visitor's overheard remark epitomizes the general reaction: "If only *my* children could grow up in such a place!"

Research and the Future

Yet one aspect of the Dow picture must not be left out. It has been demonstrated what a large part research played in the philosophy that built this company. A brief survey of the present direction of creative research will indicate that the same spirit still prevails. Back of the whole program is a basic area covering what may be called the *Search for Research*. By projecting what the fundamental human wants are and the

changes which are likely to take place in the future, the company determines the orientation of research studies. For example: *recreation* has become a need almost as basic as food or shelter. Special clothing for sports and leisure, special equipment for these pursuits, can provide fields for investigation into the improvement or adaptation of plastics, textiles, dyes, resins, etc. *Education,* a greater and greater preoccupation of our culture, is using more teaching aids such as, for example, microfilm: film still provides research with a challenge to improvement in dimensional stability and length of life. From such pre-research speculations on basic needs it is possible that definite projects can be developed.

Present fields of research. More specifically, the many research people working for Dow in the Midland area are engaged in four major fields, as follows:

I. High Polymer Chemistry, which accounts for the chemical industry's largest growth since the war. This includes plastics, paints, films, textiles and substances to control viscosity.

II. Growth Control. This field has received much publicity for one of its smaller aspects, radiation. The field as a whole serves many needs in agricultural and pharmaceutical chemistry by controlling bacterial growth and that of undesirable plants. The well-known Dowicide group includes products resulting from this line of research.

III. Inorganic and Organic Combinations, such as the silicones.[6]

IV. Inorganic Chemistry, a field that has lost ground in research in the past 25 years in comparison with organic. Interest is now leading students into concern with crystalline structure, intermetallic compounds and the properties of rare earth minerals. The various magnesium alloys for which Dow is so well known have been developed through this sort of study. It is a field with great possibilities, for the needs of high speed, high temperature engines for aircraft and missiles call for much work.

Many research projects are carried out through two-way exchange of information and project contracts with other industries. Some involve grants to universities: Dow is outstanding among chemical companies for its interests in this direction. Such grants are of three types:

Restricted: retaining professors as consultants, or sponsoring specific projects

Unrestricted: pure research

Capital improvements

One might term research into human capabilities a particular long-term investment in future scientific training that Dow carries out. Periods of plant employment are offered to the high school science teachers in the Midland area. These periods combine practical laboratory experience on an advanced level with seminars with well-known scientists invited to take part in the project.

With this activity this paper must finally close. Just as the glass-blowing survival typified Dr. Dow's realization that some handicrafts cannot be displaced, so the teacher employment plan can stand for another of the founder's concerns: that a machine culture cannot afford to forget its survival depends upon the production of mentalities to direct it, and upon the retaining of personal contacts at all levels, however large and complex our society becomes.

[6] See "Tall Tale on the Tittabawassee" by Anne C. Garrison, *Business Topics,* III, 3, 1955, pp. 9-17.

I wish to thank the management of the Dow Chemical Company for its cooperation during the writing of this article.

OUR SECOND JOKE*

This has to do with the wife of an employee of the Dow Chemical Company who, for reasons of a family crisis, called the personnel office in a frantic attempt to get hold of her husband on a weekend: she thought he might be out with some fellow-workers. The office was impeded in its efforts to help her because she didn't know her husband's line of work. Could she get hold of one of his pay slips anywhere around the house? No, she couldn't. Well, could she recall the names of his co-workers or his foreman? Didn't he ever mention them? No, he never discussed his job. Every question was stopped cold: this was apparently a man who kept his home and his work in different pigeon-holes. Desperate, the company representative finally asked, "What does he smell like when he gets back from the plant?" And the tearful wife replied, "He smells of GRAPES." They called his foreman and located the strayed husband within an hour.[1]

*The first was in the January 1957 issue, buried in a footnote.

[1]Dow manufactures methyl anthranilate, an aromatic chemical used in grape soda. Hence one part of the plant smells like a vineyard during the vintage. Another part, where coumarin is made, has the delicious aroma of sugar cookies. There are some other odors, also.

PONTIFEX MAXIMUS

Considering the cultural importance and frequent beauty of bridges, it is curious that no memorable statements have been made about them. We wished to signalize the opening of the Straits Bridge with a cogent quotation or two, and found none. Yet the significance of building a crossing is recognized by the resounding title the Romans gave their high priest: Pontifex Maximus, or Chief Bridge-Builder, presumably because he provided the connecting link between two worlds.

On the occasion of the forging of the connecting link that makes one state out of our two peninsulas, we would like to salute Dr. David B. Steinman, designer of the Straits Bridge, as our Pontifex Maximus. Similar acclaim was awarded him earlier in the year by the American Institute of Steel Construction, which gave him the J. Lloyd Kimbrough Medal for outstanding contributions to design and construction in the structural steel industry. More than 400 bridges throughout the world originated on his drawing board, with our own Pons Maximus as his Magnum Opus.

POWER FOR CONSUMERS

*By LELAND E. TRAYWICK**

Future planning is the watchword of the public utilities; merely keeping in step with present needs would halt the expansion of industries that depend upon power. The present article examines the pattern of growth of the public utilities, that are in the vanguard of our economic development.

One of the greatest economic stories ever told is the one based on energy and its use. As a country, the United States has experienced an economic growth that is phenomenal among nations. Its increase in production has outstripped its increase in population many times. Expressed in 1953 dollars, national private (non-government) gross product rose from some $11 billion in the 1850's to $344 billion in the 1950's—or almost 30 times! In the same time period the number of privately employed laborers increased from seven to 56 million—only eight times!

Of course, there are factors other than energy which are important. Clearly, a capitalistic system and materialistic motivation are conducive to great productivity. Naturally, machine technology, inventiveness, and "know-how" are most essential ingredients in any economic development of national importance. The resources — natural, mechanical, human —must obviously be in sufficient existence and must be utilized with efficiency by that important coordinating factor called management if any economic success is to accrue. Yet, too often there lies behind these apparent factors a neglected one—that of the development of energy and its ultimate use by consumers.

During the past two centuries both materials and power have altered in form. Mankind has moved from epochs of wood as a prime material and animals as prime movers to epochs of steel alloys and gas-electric power along with internal combustion engines. Also, it is patently obvious that mankind stands near great developments in synthetics and atomic energy. Pertinent data show the increases in energy production and consumption in the United States as taken from the latest Statistical Abstract published by the U. S. Department of Commerce.

Especially interesting here are the percentage changes that have occurred since 1900. For example, in that year only 3.2 percent of the energy came from natural gas, but in 1954 some 26.6 percent of all energy produced from mineral fuels and water power was from natural gas. This represents an increase of 3600 percent. The increase in crude petroleum production was some 3500 percent. Meanwhile anthracite coal was decreasing in its use over the same time period and bituminous coal increased only about 85 percent. Such changes are significant in the changing economy of the United States during the first half of this century. Cheaper and more potent energy sources meant both economy and greater productivity. For the consumer this had a significant result: a higher standard of living.

Similarly, consumption of energy shows the changes of the times. Unfortunately the data are not available for the period 1900 to the 1950's, but have been assembled only for the latter part, 1920-1954.

*Dr. Traywick is Assistant Dean and Professor of Economics, College of Business and Public Service, Michigan State University.

ENERGY PRODUCTION FROM MINERAL FUELS AND WATER POWER

1900 to 1954

(In trillions of British thermal units)

Year	Total	Water Power	Anthracite Coal	Bituminous Coal	Crude Petroleum	Natural Gas
1900.....	7,893	250	1,457	5,563	369	254
1905.....	11,772	386	1,973	8,255	781	377
1910.....	15,375	539	2,146	10,928	1,215	547
1915.....	16,822	659	2,260	11,597	1,630	676
1920.....	21,340	738	2,276	14,899	2,569	858
1925.....	21,571	668	1,570	13,625	4,430	1,278
1930.....	22,060	752	1,762	12,249	5,208	2,089
1935.....	19,727	806	1,325	9,756	5,780	2,060
1940.....	24,969	880	1,308	12,072	7,849	2,860
1945.....	32,123	1,442	1,395	15,134	9,939	4,213
1946.....	31,322	1,406	1,537	13,989	10,057	4,333
1947.....	35,098	1,426	1,453	16,522	10,771	4,926
1948.....	35,890	1,481	1,451	15,707	11,717	5,534
1949.....	30,606	1,539	1,085	11,472	10,683	5,827
1950.....	34,422	1,573	1,120	13,527	11,449	6,753
1951.....	37,678	1,559	1,084	13,982	13,037	8,016
1952.....	36,739	1,581	1,031	12,231	13,282	8,614
1953.....	36,987	1,522	786	11,981	13,671	9,027
1954 (prel.)...	35,194	1,449	689	10,270	13,433	9,353

ENERGY CONSUMPTION FROM MINERAL FUELS AND WATER POWER

1920 to 1954

(In trillions of British thermal units)

Year	Total	Water Power	Anthracite Coal	Bituminous Coal	Crude Petroleum	Natural Gas
1920.....	20,135	738	2,179	13,325	3,027	866
1925.....	21,347	668	1,627	13,079	4,641	1,332
1930.....	22,742	752	1,718	11,921	6,148	2,203
1935.....	19,355	806	1,298	9,336	5,799	2,116
1940.....	24,008	880	1,245	11,290	7,662	2,931
1945.....	32,005	1,442	1,311	14,661	10,199	4,392
1946.....	30,684	1,406	1,369	13,110	10,286	4,513
1947.....	33,231	1,426	1,224	14,302	11,131	5,148
1948.....	34,301	1,481	1,275	13,622	12,198	5,725
1949.....	31,904	1,539	958	11,673	11,709	6,025
1950.....	34,421	1,573	1,013	11,900	12,912	7,023
1951.....	37,046	1,559	940	12,285	14,255	8,007
1952.....	36,677	1,581	897	10,971	14,634	8,594
1953.....	37,778	1,522	711	11,182	15,342	9,021
1954 (prel.)...	36,717	1,449	632	9,510	15,406	9,720

It is of interest to note the importance of both types of coal in 1920. Anthracite accounted for 10.8 percent of all energy consumed and bituminous for 66.2 percent. By the middle of the 1950's anthracite was a bare 1.7 per cent and bituminous coal consumption had dropped to only 25.9 percent of all energy consumed. In the meantime crude petroleum had increased from 15.1 percent of the total to 42 percent and natural gas from 4.2 percent to 26.5 percent. Water power consumption remained almost constant: 3.7 in 1920 and 3.9 in 1954. These changes in the internal composition of total energy consumptions in the United States are even more striking when one realizes how much of an increase over the years this has meant. For example, both types of coal declined, anthracite by over 70 percent and bituminous by almost 29 percent, but crude petroleum increased by 400 percent and natural gas by a little over 1020 percent. In both production and consumption of energy natural gas has shown the greatest proportionate increases.

One would almost expect it to follow that there have been substantial increases in the number of customers and the revenues of the gas utility industry. The American Gas Association gives the pertinent data in its yearbook, *Gas Facts*.

The total and the residential customers almost double from 1932 to 1955, the commercial more than doubles, but the industrial customers increase by only some 63 percent. Interestingly the revenues show tremendous gains in all classes of service. This reflects the inflations and deflations (note 1938) that have occurred since 1932. It does not tell the whole story, obviously, as no cost data are provided.

Net income data are given for the gas utility and pipeline industry from 1945 to 1954. These show an increase from $157 million to $450 million, 1945 through 1954. It is to be noted that this increase is in net income, which means

GAS UTILITY INDUSTRY—CUSTOMERS AND REVENUES BY CLASS OF SERVICE—1932-1955

Year	Customers (1000)					Revenues ($1000)				
	Total	Residential	Commercial	Industrial	Other	Total	Residential	Commercial	Industrial	Other
1932...	15,532	14,452	999	73	8	723,228	537,146	92,807	90,674	2,601
1935...	15,819	14,725	1,014	72	8	726,809	503,111	90,815	130,453	2,430
1936...	16,170	15,026	1,058	77	9	770,129	516,049	97,318	151,474	5,288
1937...	16,605	15,466	1,056	74	9	801,939	528,297	99,768	167,073	6,801
1938...	16,876	15,697	1,094	75	10	777,167	522,593	101,061	144,902	8,611
1939...	17,128	15,926	1,121	73	8	814,156	537,565	105,240	164,921	6,430
1940...	17,600	16,381	1,138	73	8	871,682	573,319	111,964	181,852	4,547
1941...	18,126	16,904	1,137	78	7	914,036	574,842	114,323	219,805	5,066
1942...	18,734	17,511	1,137	78	8	994,318	622,670	127,039	237,517	7,092
1943...	19,064	17,838	1,141	77	8	1,064,044	647,558	127,528	277,496	11,462
1944...	19,585	18,320	1,177	82	6	1,108,162	666,734	133,120	293,315	14,993
1945...	19,977	18,607	1,278	80	12	1,152,807	705,211	148,597	280,908	18,091
1946...	20,636	19,157	1,377	87	15	1,212,565	754,073	160,982	284,317	13,193
1947...	21,416	19,835	1,474	91	16	1,395,616	861,558	190,759	325,642	17,657
1948...	22,245	20,562	1,571	94	18	1,579,462	957,925	220,906	377,408	23,223
1949...	23,035	21,264	1,657	97	17	1,688,595	1,031,293	238,077	395,559	23,666
1950...	24,001	22,146	1,739	100	16	1,948,002	1,177,070	265,571	479,610	25,751
1951...	24,953	23,042	1,787	101	23	2,228,109	1,334,967	294,435	557,068	41,639
1952...	25,850	23,852	1,869	104	25	2,467,284	1,456,718	321,309	639,236	50,021
1953...	26,705	24,647	1,926	107	25	2,718,624	1,574,428	338,914	739,202	66,080
1954...	27,528	25,398	1,991	112	28	3,052,144	1,782,670	377,749	820,515	71,210
1955...	28,538	26,305	2,083	119	31	3,473,328	2,026,623	434,405	932,652	79,648

after operating costs, depreciations, retirements, depletion, taxes, interest on long term debt, and all other costs have been removed. This increase of some 185 percent, however, is not reported in constant dollars from *Gas Facts,* but rather it is in terms of current dollars thus reflecting the inflationary spiral to which money has been subjected since World War II. It is still substantial, of course, and reflects the financial success of these enterprises.

The future of this and any industry is naturally at the mercy of the changing times. More than this, however, the gas industry must be prepared by having sufficient reserves to protect itself and its customers. From year to year new gas fields and new pools in old fields are discovered. Along with extensions and revisions of former discoveries tremendous net additions are made to the existing natural gas reserves. These activities since World War II are reflected in the accompanying table.

It is remarkable how the proved reserves have shown an increase each year. If taken from 1945 to 1955, they amount to over 51 percent, almost 76 trillion cubic feet. The additions each year indicate very pointedly and obviously that reserves are increasing faster than use. One should not jump to the conclusion, however, that natural gas is unlimited or that the distribution companies can contract to sell gas to any and all customers who desire this product. Once the company has entered a contract to provide a residence with space heating this becomes binding. The gas cannot be turned off arbitrarily. Service is a continuing obligation and the company must be prepared to render it on an indefinite basis to residential users.

Industrial requirements, on the other hand, tend to be less urgent as far as natural gas is concerned. Industry needs fuels not so much for space heating as for electrical power. Today significant amounts of this power are generated from natural gas. One ordinarily thinks only of coal or water power in this connection. The facts, however, show that millions of cubic feet of gas and millions of barrels of fuel oil also are consumed in the production of electrical energy. The table shows the amounts of fuels consumed in producing electrical energy.

If these fuels are reduced to coal equivalents a grand total of 35,791,000 short tons were consumed in 1920. Oil and gas were thus only about 12 percent of the total fuels consumed. By 1955, however, the equivalents and coal had risen 480 percent to a total of 206,899,000 short tons. By now oil and gas were

ESTIMATES OF NATURAL GAS RESERVES: 1945 to 1955
(In millions of cubic feet)

Year	Natural Gas Added During Year			Net increase in underground storage	Net production during year	Estimated proved reserves as of end of year	Increase over previous year
	Total	Extensions and revisions	Discoveries of new fields and new pools in old fields				
1945	.....	.....	.....	.....	.....	147,789,367	.....
1946	17,729,152	(1)	(1)	(1)	4,942,617	160,575,901	12,786,535
1947	10,980,824	7,570,654	3,410,170	(1)	5,629,811	165,926,914	5,351,013
1948	13,898,572	9,769,483	4,129,089	51,482	6,007,628	173,869,340	7,942,426
1949	12,674,299	8,061,429	4,612,870	82,746	6,245,041	180,381,344	6,512,004
1950	12,049,732	9,172,381	2,877,351	54,301	6,892,678	185,592,699	5,211,355
1951	16,052,991	13,013,606	3,039,385	132,751	7,966,941	193,811,500	8,218,801
1952	14,345,513	8,934,470	5,411,043	198,850	8,639,638	199,716,225	5,904,725
1953	20,453,016	13,371,355	7,081,661	516,431	9,238,540	211,447,132	11,730,907
1954	9,599,203	4,632,309	4,966,894	90,906	9,426,509	211,710,732	263,600
1955	22,017,194	16,298,125	5,719,069	87,637	10,118,118	223,697,445	11,986,713

(1) Not available.

CONSUMPTION OF FUELS BY ELECTRIC UTILITIES FOR PRODUCTION OF ELECTRIC ENERGY: 1920-1955

Year	Coal (All types; 1000 short tons)	Fuel Oil (1000 42-gal. bbl.)	Gas (million cu. ft.)
1920	31,640	12,690	22,136
1925	35,615	9,794	45,472
1930	40,278	8,805	119,553
1935	32,715	11,257	124,118
1940	51,474	16,325	180,096
1945	74,725	20,228	326,212
1947	89,531	45,309	373,054
1948	99,586	42,645	478,097
1949	83,963	66,301	550,121
1950	91,871	75,420	628,919
1951	105,768	63,945	763,898
1952	107,071	67,218	910,117
1953	115,897	82,238	1,034,272
1954	118,385	66,745	1,165,498
1955 (prel.)	143,660	75,258	1,151,834

31 percent of the total fuels consumed. Gas increased proportionately much more than did fuel oil.

Significantly, too, the output of coal and coal equivalents increased from production of 23,495 million kilowatt hours of electricity in 1920 to 433,684 million by 1955—a margin of 1750 percent. Such important gains as this have reduced the cost of producing a kilowatt hour of electricity from 3.0 pounds of coal and equivalents in 1920 to only .95 pounds in 1955.

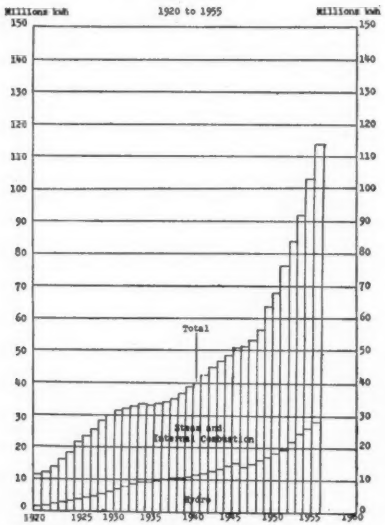
Progress, of course, is not only something for the past but also a necessity of the future. The projections of electrical energy requirements from the middle of the 1950's to 1980 show a tremendous future need. These estimates have been made by the Federal Power Commission and have assumed prosperous peacetime conditions. They exclude generation by industrial facilities and railways.

Clearly the expectation is that the largest increases in both energy use and peak loads will occur up to 1960. From

Year	Energy Use			Peak Load		
	Billion kwh	Percent increase from 1954	Percent increase for each time interval	Million kwh	Percent increase from 1954	Percent increase for each time interval
1954	477.9	.....	.....	90.4	.....	.....
1960	754.5	57.9	57.9	139.4	54.2	54.2
1965	956.5	100.1	26.8	177.0	95.8	27.0
1970	1,173.2	145.5	22.7	216.9	139.9	22.5
1975	1,419.5	197.0	21.0	261.9	189.7	20.7
1980	1,695.5	254.8	19.4	311.7	244.8	19.0

there on until 1980 the increases by five year intervals are half and even less than half of this initial six year increase. Such a tapering in the growth of energy requirements is normal for any growth pattern. Industrially or biologically, growth and even learning tend to behave in just this fashion—a period of great expansion and upward surge and then a tapering off preparatory for another period of tremendous expansion. This is the familiar "S" curve type of growth and this seemingly is what the Federal Power Commission adhered to in forecasting the electrical energy requirements by 1980. At first glance it is almost fantastic that the requirements would exceed a trillion and a half kilowatt hours of electrical energy, but when the projection is unravelled in terms of growth and growth patterns it begins to make some sense.

Installed Capacity of Electric Utility Generating Plants:



Source: Federal Power Commission

These projections are in large measure, too, a key to the behavior of the entire economy for the next two and a half decades. The heart of any industrial nation is its energy. Wilbert G. Fritz, who was one of the associates with J. Frederic Dewhurst and the Twentieth Century Fund, put it excellently in the 1955 edition of *America's Needs and Resources:*

> Of the resources needed to maintain our industrial civilization, the energy-providing ones are most vital, because they are required constantly in huge volume to supply heat, light, and motive power. The extraordinary gains in American productivity and levels of living have been due largely to our possession of coal, petroleum, natural gas and water power and to our use of these resources, more than any other nation, to reduce human toil and multiply its effectiveness. Each person in the United States has scores of energy 'slaves' working for him.
>
> Our tremendous increases in output per worker and per man-hour have been made possible largely by drawing upon inanimate energy in place of human energy. Since 1900 we have increased our supply of inanimate energy almost fourfold. Per capita we consumed almost twice as much energy in 1950 as in 1900. Most of the increase in the first two decades of this century came from coal. Since then the use of natural gas and petroleum has grown rapidly and coal use has declined somewhat. Liquid and gaseous fuels now supply a larger share of the total than the solid fuels. Use of water power, although increasing, still accounts for only about one percent of the total energy supply. Consumption of the mineral fuels — coal, petroleum, and natural gas — is expected to grow at almost the same rate as the GNP.

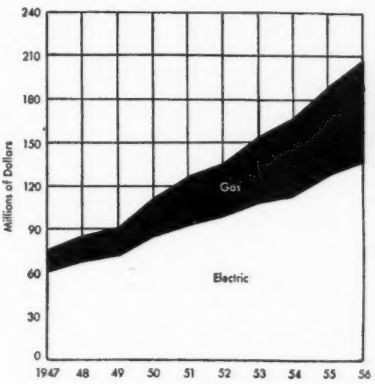
Here, of course, he is referring to the gross national product, which is a measure in dollars of all goods and services produced in the United States and includes depreciation and maintenance. The parallel growth of GNP and energy is not just accidental.

It is no wonder that the United States under these conditions past, present, and future has a place among nations that makes it rank first in material things. With almost 6 percent of the world's

people and a little short of 7 percent of the earth's surface, the U. S. now both produces and consumes some 35 percent of the goods and services of the world and manufactures almost 50 percent of its factory-produced goods. Such is the 1957 indication of Thomas R. Carskadon and George Soule in their 1957 Twentieth Century Fund survey *USA in New Dimensions*. They point out further: "The aggregate real income of the more than 160 million Americans today probably exceeds the combined income of the 600 million people living in Europe and Russia and far surpasses the total income of the more than one billion inhabitants of Asia." Perhaps it is an old and lugubrious saw, but man too often is a poor assessor of assets because of inadequate comparative knowledge.

Of the progress in each of the 48 states, that in Michigan has closely paralleled and often exceeded the national growth. By the middle of the 1950's some 55 private companies, 15 cooperative and 9 public electric utilities provided power for the state. Of the gas utilities 15 served parts of 51 of the state's counties. Of all these utilities, however, two were dominant: The Consumers Power Company and the Detroit Edison Company. By the beginning of 1957 Consumers Power had over 800,000 electric customers and Detroit Edison almost 1,200,000. In addition Consumers Power served some 444,000 gas customers. Indicative of the growth in both gas and electric utility consumption are the operating revenues during the past ten years. For the Consumers Power Company alone they increased some 171 percent as indicated in the chart.

Electric and Gas Operating Revenue 1947-1956



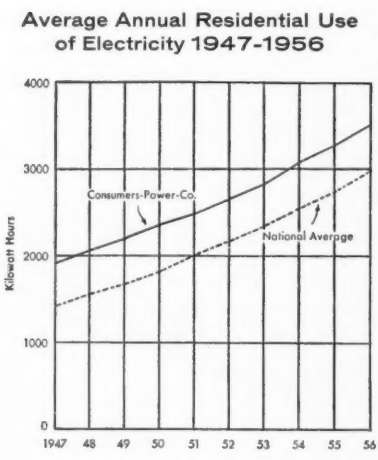
Electric and gas operating revenue increased 171% from $76,561,000 in 1947 to $207,345,000 in 1956. Electric revenue increased 128% and gas revenue 332%. Other revenue, including steam heating, amounted to $1,049,000 in 1956.

Gas sales, on the other hand, completely outstripped national gas sales to industry and even the Federal Reserve Board index of industrial activity, 1945-1956, when taken on a comparative basis.

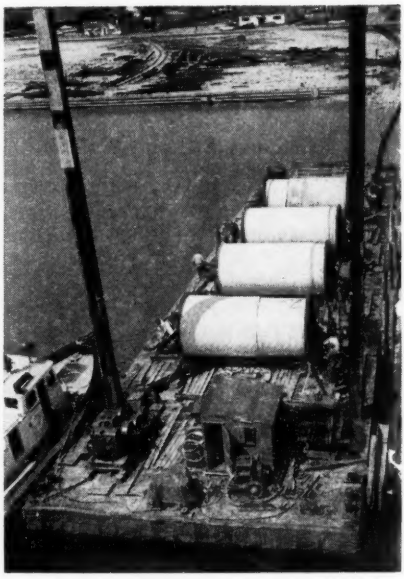
Such growth is certainly indicative of the relatively larger increase of the sales of natural gas in Michigan as compared with the nation as a whole and of the relative increase in the use of gas.

It should also be borne in mind that

Year	FRB Index of Industrial Activity	National Industrial Gas Sales	Consumers Power Gas Sales
1945	100	100	100
1950	102	158	162
1951	113	176	184
1952	116	193	219
1953	125	209	284
1954	117	228	309
1955	130	244	397
1956	134	266	401



Average annual use of electricity by residential customers increased 84% from 1,925 kilowatt-hours in 1947 to 3,536 kwh in 1956. The 1956 figure is 19% greater than the national average of about 2,980 kwh.



gas consumption in Michigan would be terribly hampered if it were not for the underground storage facilities of Consumers Power Company at Riverside, Winterfield, and Cranberry Lake which are just southeast of Cadillac. During the summer months when consumption is low millions of cubic feet of gas are pumped underground into sandstone rock by methods of high compression. When winter demands are heavy, the gas is there to use.* This has been very significant in keeping Michigan proportionately ahead of the nation in natural gas consumption.

In Michigan, electricity, likewise, has surpassed the national consumption when compared on an annual basis of residential use and has shown a tremendous increase.

In step with Michigan and its economic development was the laying of the electric cables across the Straits of Mackinac in June, 1956. Even as the Mackinac Bridge will link the Upper and Lower Peninsulas in 1957, so also will miles of cables serve as a bridge for public service. In the photograph each reel carried four miles of Consumers Power cables and weighed 75 tons.

In the Detroit area, of course, the most significant use of energy is that devoted to automotive production and other industries. Car production in 1949 was 5,128,000 and Detroit Edison's kilowatt hour industrial sales were 3,058,000,000 as reported in their 1956 annual report. In 1956, these figures were 5,801,000 cars and 5,822,000,000 kilowatt hours. An increase of 13 percent in U. S. car production thus contrasts with a 91 percent greater energy sales.

Yet, in both cases—the Detroit Edison Company and its operations in the Detroit area and "thumb" area of Michigan and the Consumers Power Company and its operation in 64 out of 68 counties in the lower peninsula—the cost of providing energy for residential, commercial,

*For further development of this very interesting subject, see *Business Topics*, June 1955, pp. 33-36, "Underground Storage of Natural Gas", Anne C. Garrison.

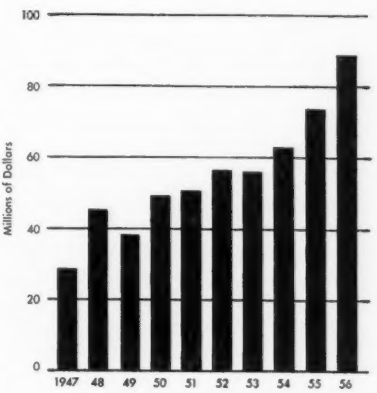
and industrial buyers has increased substantially over the years. To make it possible for these two companies to function, the revenues of each organization increased faster than the cost of doing business. In many cases in Michigan over the past decades this has not been true and the smaller companies have been bought up, made more efficient, and have been given the advantages of economies of larger scale production and distribution. The revenues, expenses, and net incomes of the Consumers Power Company and the Detroit Edison Company have increased each year during the past decade. The net income increased slightly over 122 percent for Consumers Power Company during the period 1947-1956 and over 126 for Detroit Edison Company. Yet in both cases substantial amounts of money have been retained in the companies mostly for purposes of expansion. For example, Consumers paid out of their net income in 1956 over $22 million in dividends to leave retained earnings of $8,869,044. Detroit Edison likewise paid out over $22 million and it left in this case $7,122,822 as retained earnings. Such retentions are necessary, of course, but constitute only a part of the moneys needed for expansion. As we have seen above, the demand for electricity in the United States will double in ten years. The explanation lies not only in population growth, the formation of new families and construction of new homes, but also in the fact that residential, commercial, and industrial customers are making greater and greater use of electrical service each year.

The significance of this is that all utilities must keep ahead of the times. Their growth must of necessity be greater than what is demanded at any one time. Otherwise the danger is overloading the system to such an extent that peak capacities are exceeded. In electrical terms this would mean, if reduced to the situation of the home owner, blowing all the fuses at once. One of the great fears of the electrical utility companies at the end of World War II was that the popular slogan "Let the Lights Go On Again All Over the World" would be attempted on local scales. To have done this—i.e., turn on all the lights—in any one town would literally have caused immeasurable trouble. The peak load would have far exceeded capacity.

Under normal working arrangements the peak load in Michigan comes around December 18 to 20 each year. All electric utility companies must be prepared for this by building their plants with such capacity that they can meet this peak demand with safety. To accomplish this, accurate forecasts of needs must be made and construction undertaken well in advance. It is no wonder earnings are retained and investors sought after.

For the year 1957 Detroit Edison Company estimates that some $89,000,000 will be required for new construction. Approximately $60,000,000 will be required from investors, with the balance of the funds to be provided from operations and short term borrowings from banks. Consumers Power expenditures for additions follow similar patterns. During the past ten years their picture has been that illustrated in the graph.

Expenditures for Additions and Improvements 1947-1956



Expenditures for additions and improvements increased from $29,226,000 in 1947 to $89,220,000 in 1956.

Interest rates at the highest levels in over twenty years and costs of construction are especially serious matters for utilities such as these. Smaller companies often find even greater difficulty.

Utilities are a regulated industry with a view to keeping prices in line with what consumers should pay for such necessities as electricity, gas, water and telephones. They are regulated because by their nature they are in most instances a declared monopoly. Where competition cannot prevail, regulated monopoly takes its place. This has long been established in our American capitalism and contrasts vividly with many practices in Europe, where unregulated monopolies, cartels, price fixing associations and the like too often prevail. Public utility commissions, however, are of necessity mindful in their regulation that the utility rates need to be high enough so that sufficient funds will accrue to the utility not only for purposes of paying operating expenses such as salaries, wages, maintenance and fuel costs, but also for purposes of paying stockholders and bondholders in sufficient amounts that they will be encouraged as investors. The companies cannot finance all of their needed expansions and developments out of current earnings based on present rates. Nor do they need to. A more economical method is to keep the rates of these necessities as low as possible so that they are within the reach of the very low income families and yet keep them high enough so that investors will supply funds for growth.

This above all should be kept in mind in public utility regulation: rates must be of sufficient magnitude to permit utility growth ahead of the economic growth of the immediate region which the utility serves. Consumers can afford to do no less than this. If they do, it is with the uneconomical foresight of the immature lad who killed the goose that laid the golden eggs. To keep in step with Michigan and to keep in step with the nation is not enough for sound economical practices of our utilities. They must plan ahead, look ahead, and be ahead.

It should be crystal clear to the most casual observer that the growth of public utilities must precede the development of new industries in an area. Whether such a development is a new location out in some wilderness or whether it is the expansion of some old and well established businesses makes no difference. Growth can take place only when the capacity for energy production has already been well established. Public utilities, therefore, are the vanguard of all economic development. The state of the union that would attract new industries and new businesses of all kinds is the state that insists upon the advancement of its public utilities. If they march ahead, progress will follow. Therefore, they must plan ahead, look ahead, and be ahead. This they have done. This they must be authorized to do.

BRAZILIANS, AWAKE!

In a world of dog-eat-dog economic competition, the alert industrialist should neither slumber nor sleep. Where was the Economic Attaché of the Brazilian Embassy when the last issue of *Business Topics* came out? Where were the directors of the Companhia Siderurgica Nacional, the Brazilian National Steel Company? Where, indeed, is national honor? None of our numerous Brazilian subscribers called to our attention the *lapsus mentis* on page 20, which ascribed Brazil's largest steel mill to Argentina. The men who pointed out our lamentable slip are a Grand Rapids engineer and a Pittsburgh musicologist. Brazilians, awake!

THE ROLE OF THE UNIVERSITY IN CONTINUING EDUCATION FOR MANAGEMENT

*By DANIEL H. KRUGER**

Are university programs in continuing education for management carrying out their function adequately? The author offers some recommendations for educational fulfillments of professional needs.

Since the end of World War II there has been a spectacular growth in educational opportunities for management. An increasing number of universities and colleges have developed a variety of programs for the business community of the nation. No statistics are available as to the number of management personnel participating in these programs. However, the number of programs being offered does suggest that business and industry are making substantial use of these educational opportunities for their personnel.

In an effort to appraise the role of the universities in continuing education for management personnel, a brief review of the types of training conducted by industry may provide insight. Training programs in industry may be roughly divided into three categories. In some aspects of these programs institutions of higher learning can make an effective contribution while in others they can offer relatively little.

Types of Training

The first type of training may be called employee or worker training. It consists of vestibule training for new employees, apprenticeship training, on-the-job training and refresher courses. In addition, programs have been developed to teach employees new skills or techniques to meet certain new situations. For example, a number of firms have instituted courses in electronics in an effort to upgrade their personnel. The universities can contribute little to these programs except through vocational education.

The second type of training activity is known as foremanship and supervision. The impetus for this kind of training stemmed from World War II during which time countless Job Instruction Training (J.I.T.), Job Relations Training (J.R.T.), and Job Methods Training (J.M.T.) programs were developed. The scope of these programs, many of which have been continued by a number of firms, has been broadened to include conference leadership, public speaking, cost reduction, methods improvement and work simplification, and human relations. These courses are usually of short duration and require little or no home study or outside preparation.

The objective, in some instances, is to remedy a local deficiency. In others, the objective is nothing more than to provide an opportunity for exposure to training. The universities and colleges have been assisting firms in developing such programs; however, the extent of assistance varies. In some cases, an institution has worked very closely with a company to develop a program designed to meet specific needs, while in others, "canned" courses have been presented. There is some questioning by faculty members as to whether this type of training is an appropriate university function.

Closely related to the second type of program is the third category of training, which is not well recognized except in the more progressive firms. It differs from the supervisory training program men-

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tioned above in its emphasis on professional training. These programs are designed especially for supervisors, staff specialists and line personnel who wish to improve themselves generally or to prepare themselves for assuming greater responsibilities in the future. Programs in this third category may include the basic or core courses which provide the student with a foundation in the general principles of the subject, or they may assume that the student has the necessary foundation, and consequently the emphasis is on specialized courses. Whether the courses include basic material or advance treatment, the objective is the same, namely to develop in the student the habit of study, the desire to seek out, to inquire. The development of the individual is associated with his ability to think, and to solve problems before they arise or before they become acute: in short, to anticipate problems and to take appropriate action.

These professionally oriented courses accelerate the self-development of the student. They broaden his outlook. These programs also provide the company with an alert group of key personnel who are capable of independent thought. Such employees are capable of assuming greater responsibilities in case of emergencies or promotion to higher positions. A group of such executives can make a sizable contribution to the organization by helping to create and maintain an intellectual atmosphere among their associates. These "students" provide the reservoir from which top executives are drawn.

The qualities of leadership necessary for executive management are hard to develop in an organization. Competency in management is not achieved by quickie courses, canned indoctrination programs, pontification of the free enterprise system, manipulation or black magic. Successful management requires insight and grounding in principles and analysis.

What The University Can Offer

It is this type of training that the institutions of higher learning can contribute most. Universities are concerned with professional training and therefore have certain advantages over the individual firms in conducting programs of this kind.

The universities are already engaged in providing educational opportunities which can be easily tapped by companies. Many universities offer correspondence courses in the area of business administration and the social sciences. Regular credit and non-credit classes are taught on the campus in the evening divisions. In addition, courses are offered at resident or university centers which are usually located in the larger metropolitan areas. Extension courses are given elsewhere in the state where there appears to be sufficient interest. In many instances, special classes are developed for particular community groups. To stimulate interest in the area of personnel and industrial relations, several universities have inaugurated programs under which students who successfully complete a prescribed number of courses are awarded a certificate.

The Role of the Conference. Probably the greatest development in continuing education for management has been in the area of conference activities. This term, as used here, includes not only conference activities, but short courses, seminars, workshops and institutes. The subject matter covers the whole area of business administration. Participation by management representatives in these educational activities provides an excellent training opportunity and complements any formal management development program which the company may have.

In recent years universities and colleges have extended their campuses to include the conference training rooms in many industrial and commercial firms. University faculty members working closely with company officials have developed special programs which are tailored to meet the needs of the particular firm. Once the needs have been identified, the university agency[1] acts in the role of an

[1]The name of the agency responsible for this type of university service varies. In some institutions

educational entrepreneur who brings together competent faculty members from various disciplines as well as experts from industry and government. The universities are in a unique position to assemble the kind of faculty necessary for such programs and at the same time to supervise them.

The faculty members participating in these programs perform a valuable service with benefits accruing to the institution, to the firm and to the individual. The faculty member gains experiences in new situations. All companies are different and he gains insight into their problems. Usually he is able to adapt and apply the general principles of his special area of study to the local situation. Working closely with the students, the faculty member can give them new perspectives in those areas of study included in the program.

These in-plant training programs are especially advantageous to smaller companies which have neither the resources nor the need for elaborate and complete in-company schools. The flexibility of such programs in terms of faculty, special design, and timing enables the company to fit them into their overall operations. Then, too, the outsider, whether he be faculty member or industrial or government representative, can bring a fresh perspective into the organization.

Continuing Education. In addition to the instructional programs described above the universities are providing continuing educational opportunities for management in other ways. The research activities of many faculty members in the area of business and management practices and of human behavior have brought the researcher in closer contact with the business community. In his quest for data the researcher has forced management to look at its own practices. This evaluation and reassessment is a vital part of the management function.

there is an Industrial Relations Center or a Management Center. In others, the Extension Division or the School of Commerce performs the service. Whatever the name, the objective is the same: to extend the resources of the university to the business community.

Use of Mailing Lists. Another service available to management is the mailing lists maintained by universities and colleges. The mailing list is not usually included in discussions of continuing education for management, but its importance warrants its consideration. Through mailing lists, firms receive bulletins and announcements of the activities of the institution. Many schools have monthly or bimonthly publications devoted to articles on various aspects of business and management. Research reports and conference proceedings are also made available through this medium. Although a nominal charge is made for some of the publications, the cost is well worth the valuable information obtained in this manner. Institutions welcome additions to their mailing lists.

While the research activities and the mailing lists are included as part of the university programs for management continuing education, the emphasis is on instruction. The instructional programs—conferences, short courses, workshops, and special in-plant programs — have grown rapidly since the end of World War II. The reasons for this impressive growth are varied, but they generally indicate the enthusiastic reception by the business community of the nation.

The Causes For Growth of Continuing Education Opportunities

One important factor in this growth is that business and industrial firms see in these educational opportunities the avenue whereby important information and insight into the complexities of business management can be obtained. These programs serve as adjuncts to company training activities. Then, too, particular or specialized training was not previously available in some firms, and therefore the university programs were welcomed.

The crucial shortage of competent management personnel also stimulated developments. Companies were searching for ways of providing short cuts by which personnel might acquire knowledge and experience. The demand for qualified executives is acute and these

programs can and do accelerate the acquisition of knowledge, the only alternative for which is experience.

Some companies participate in such activities in order to support the business administration programs of the schools of business and the community colleges. This support was vitally needed to keep these programs going because in many instances this kind of activity is either self-supporting or is given limited financial assistance.

Finally, there is the prestige value attached to joint industry–educational programs of this kind. These activities enable faculty members to get out of their ivory towers to meet with management personnel and to participate in discussions of the affairs of the market place. Concomitantly these programs enable business and industry to meet with faculty members to discuss and exchange ideas; theory and practice commingle. Management personnel are able to examine their own practices against a broader background. Furthermore, there is a growing awareness of the need for close cooperation between education and business.

The very mechanics of many of these programs depend upon close cooperation between business and the universities. As indicated, the conference activity is usually tailored to the needs of the group being served. In most instances these activities are jointly sponsored by trade associations, employer organizations, professional management societies or particular firms. The key to a successful university program of continuing education for management depends, to a large degree, on the extent of cooperation between the business community and the educational institution.

This cooperation, however, must be tempered with understanding of the role of the university. It should be remembered that universities cannot engage in activities which propose to supply ammunition which can be used against other groups in society. A dramatic example of this would be the inclusion in a conference program for management of a subject which dealt with "how to bust the union". Conversely, universities in their worker education programs should not include such topics as "how to usurp management's prerogatives" or "how to conduct a successful picket line". In other words, the university programs, if they are to have value in terms of being a legitimate university function, must emphasize professional training for and of management.

The Program of the Future

Of necessity, the universities and colleges will have to focus attention on professional training for management. The impending tidal wave of students will tax to the limit the educational resources of the nation. To the teaching of undergraduates and graduate students must be added the ever growing number of adult citizens. With limited resources, the educational institutions may be forced to restrict their conference activities. There just will not be sufficient manpower for the institutions to satisfy every request for training. As indicated earlier, there is involved here a fundamental question as to the types of training in which the universities can make their maximum contribution.

Recommendation. While the demand will grow, it is contended that the growth of the programs should be more along professional lines. The educational institutions in so doing will be performing a valuable service. Furthermore, if the universities are not willing to provide for the professional needs of the total community, the community will look elsewhere for the servicing of their needs. It may be said that the success of higher education in obtaining needed financial support from business and industry will depend significantly on how well professional training needs are satisfied. This important aspect should be borne in mind by university administrators in their allocation of resources, both faculty and financial.

CURRENT BUSINESS CONDITIONS

*By JOHN H. HOAGLAND**

Current business conditions are not good. Although there has been a high level of business activity during the first nine months of 1957 this level of activity is falling and the underlying conditions continue to deteriorate. There is danger that business activity will decline considerably before beginning any general long run improvement. To maintain the present level of business activities, underlying business conditions will have to improve. The prevention of excessive price inflation is still a problem, but declining business activity is becoming an even more acute problem.

The early stages of a business recession have already occurred. The extent to which these will continue to materialize depends considerably on what actions the government, management, labor, and the consuming public take in the weeks and months ahead.

Industrial production hit its postwar peak of 147 in December, 1956, as measured by the Federal Reserve Board's adjusted index of industrial production (1947-49=100). For 1957 this index shows the slipping activity as follows:

Jan.—146	Apr.—143	July—144
Feb.—146	May—143	Aug.—145
Mar.—145	June—144	Sept.—144 (Preliminary)

This index of industrial production for September, 1957 (latest figure available) was the same as September, 1956. An important difference, however, is that in 1956 industrial production was climbing, while in September, 1957 it was declining. Other more current indices indicate that business activity has continued to decline during October.

Barron's Weekly Index of physical volume of business, adjusted for seasonal and long-term growth trends, indicates the continued business decline as follows:

Week Ending	*Barron's Index*
Sept. 28	99.1
Oct. 5	99.2
Oct. 12	99.0
Oct. 19	98.5
Oct. 26	97.6
Year Ago	110.0

Steel Production has been declining in recent weeks as indicated by the American Iron and Steel Institute. The first half of 1957 steel production operated at about 92% of rated capacity. Earlier there were predictions that during the fourth quarter steel production would operate at 85% to 90% of rated capacity. These predictions have recently been revised downward to 80%, and even these may prove to be on the high side.

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Week Ending	% of Rated Capacity	Index 1947-49=100
October 5	82.6	131.7
October 12	82.2	131.0
October 19	80.9	128.9
October 26	80.2	127.7
Year Ago	101.3	155.2

Railroad Carloadings, frequently a key business barometer, have been declining considerably in recent weeks. Thru August, the total carloadings for the first eight months of 1957 had trailed the like period of 1956 by 2.2%. During September, 1957, carloadings lagged behind the same month a year ago by 9.6%. Since then the situation has become even worse, as indicated below.

Week Ending	% Change From 1956	% Change From Preceding Week
October 5	− 8.3	+ 1.1
October 12	− 9.9	− 0.8
October 19	− 12.3	− 2.0
October 26	− 13.8	− 3.2

Machine Tool Orders, widely regarded as a business barometer, have dropped drastically in recent months. For September, 1957 these orders were off 35% from the preceding month and off 63% from September, 1956. This was the lowest level since April, 1950, and there is not much sign of immediate improvement. The backlog of machine tool orders has also considerably decreased. The following tabulation shows these for 1957:

Month	Orders (In billions of dollars)	Shipments (In billions of dollars)	Order Backlog (in months)
Jan.	63.2	76.6	6.0
Feb.	58.2	77.7	5.8
Mar.	58.9	89.1	5.5
Apr.	51.3	87.8	5.0
May	41.4	78.5	4.6
June	43.1	80.0	4.2
July	55.5	58.7	4.2
Aug.	44.5	63.2	4.0
Sept.	28.8	64.6	3.7

Paperboard has been used by some as an indicator for predicting better business ahead. However, the sales of paperboard at this time of year are influenced by predicted store sales and these predictions do not seem to be holding up, as indicated later. The validity of paperboard indicating a definite fall upturn must be questioned. New orders and the order backlog for paperboard are slipping each week. If they continue this trend, they will soon be falling behind the like period of 1956.

Paperboard (Thousand Tons)

Week Ending	New Orders 1957	New Orders 1956	Order Backlog 1957	Order Backlog 1956
Sept. 28	295.4	249.9	444.6	410.2
Oct. 5	403.7	376.8	547.0	503.4
Oct. 12	273.6	257.1	517.4	470.4
Oct. 19	254.9	252.0	467.2	442.3
Oct. 26	243.2	240.3	414.6	401.8

Construction Activity has been a strong point in the 1956 and 1957 economy but even this seems to be passing its peak. Already privately financed construction has slipped below its 1956 level and with many business conditions turning down this can be expected to retreat even further. Publicly financed construction is still high and although it too may slip, it will probably be bolstered by such activities as the federal highway program. To show how far some of the construction activity has already slipped, note that new non-farm dwelling units started in September were the lowest for September since 1948, and the total of these units for the first nine months of 1957 were only 793,400 units, the lowest total for this period since 1949. Probably less than 1,000,000 non-farm dwelling units will be started during 1957.

Electrical Output is running ahead of last year, but when one considers this usually has run about 10% ahead of the preceding year, the following statistics show electrical output is falling behind the usual increase.

Distribution of Electricity

Week Ending 1957	*Compared to Same Week 1956*
Oct. 5	+2.0%
Oct. 12	+3.6%
Oct. 19	+3.1%
Oct. 26	+3.5%

Consumer Spending has been one of the items of strength during 1957, but even this is showing signs of slipping. Nationwide department store sales for the first eight months of 1957 were running about 2% ahead of last year. They now are beginning to fall behind last year's performance as indicated below. One must seriously question the predictors who said that department store sales for 1957 will exceed 1956 by 3% to 5%.

Week Ending	*% Change From 1956 Week*
Sept. 21	−4
Sept. 28	0
Oct. 5	0
Oct. 12	−1
Oct. 19	0

Similarily, a survey by the Wall Street Journal of sales for 47 of the nation's chain stores indicates a decline in consumer spending.

Type of Store	*Percent Change from Year Earlier*	
	Sept., 1957	*Jan.-Aug., 1957*
Variety	− 0.8	+ 3.3
Grocery	+ 9.7	+ 9.9
Mail Order	+ 1.7	+ 4.7
Women's Wear	− 1.2	+ 9.6
Men's Wear	− 5.1	+ 2.5
Shoe	+ 4.6	+ 9.0
Auto Accessories	+ 8.6	+ 6.9
Junior Dept. Store	− 2.0	+ 3.9
Drugs	+13.2	+10.8
Furniture	− 7.4	− 0.9

Both these indicators of consumer spending are influenced by inflated prices. If information were available on physical volume instead of dollar volume the current situation would show up even more unfavorably.

Automobile Production for the first ten months of 1957 has been 5,038,841 compared to 4,675,034 for the like period of 1956. The model change-over was later in 1957 than 1956 and thus October, 1957 production lagged. By early November production again climbed to the 1956 level. This pattern of 1957 automobile production makes the trend of such statistics as the Federal Reserve Board index of industrial production even less favorable. Even with rising automobile production in October business activity continued to decline.

Automobile Production

Week Ending	*1957*	*1956*
Oct. 5	21,980	70,175
Oct. 12	38,650	88,683
Oct. 19	72,127	104,621
Oct. 26	105,004	117,583

Automobile Sales for 1957 were early this year predicted as 6.5 million cars. The spring upsurge of car sales did not materialize and sales forecasts were revised downward. The recent large inventory of 1957 model cars has apparently been mostly liquidated thru price cutting and hard selling. The 1958 model cars are released and some people are predicting a 6 million car sales year for 1958. Many are hoping that the 1958 model cars will provide the needed boost to our lagging business economy. However, unless conditions change, it is difficult to conceive how this will occur in the face of such declining statistics as have been previously mentioned, plus such factors as reduced overtime, a declining stock market, continued expansion of credit selling, and the recent price cutting on the 1957 models. It will be an extremely difficult task to merchandize 6 million cars during 1958. This forecast of 6 million car sales in 1958 is probably too high, as the 6.5 million forecast was too high for 1957.

Sales and Inventories. According to the U. S. Department of Commerce statistics of recent months manufacturers' sales, new orders, and unfilled orders have been falling, but inventories have *not* been reduced (see table below). Furthermore, compared to a year ago, sales are up .7 billion, new orders down .4 billion, unfilled orders down 7.3 billion, and inventories up 3 billion. Thus the business economy is in a more vulnerable position than it would have been if inventories had been successfully reduced during the past year.

Manufacturers' Sales, Orders, and Inventories
(billions of dollars)

	Seasonally adjusted		
	July '57	*August '57*	*September '57*
Sales	29.0	28.6	28.2
Inventories	54.1	54.2	54.1
New Orders	27.0	27.3	26.8
Unfilled orders (not available on seasonally adjusted basis)			
Unfilled orders (unadjusted)	59.2	57.8	56.3

Employment dropped about 700,000 during September. This drop was reported as being due largely to the return of students to college. Spot announcements of layoffs plus increased claims for unemployment compensation indicate that probably there are also other causes of this increase in unemployment. Furthermore, the failure of the hirings by manufacturers to show the usual July to August spurt and the nationwide failure of college enrollments to meet expectations point toward economic uncertainty.

Defense Spending has been cut back during the third quarter of 1957. This has added to the economic downturn. There is now some relaxation of defense spending controls and some reenstatement of previous cut backs. What finally happens to defense spending is one of the determinants of what happens to business activity.

Stock Market, as measured by stock prices, declined about 20% during the past three months. As a business indicator this shows a lack of confidence by investors in the business outlook. Corporate earnings and dividends undoubtedly will fall below their previous level. This, like the reduction in overtime pay for workers, acts to reduce consumer spending.

Inflation continues to be a problem. Prices of many items, and wages paid to many workers, continue to rise. The cost of living, as measured by the consumer price index of the Bureau of Labor Statistics, rose again in September for the thirteenth consecutive time. However, the rise from 121.0 in August (1947-49=100) to 121.1 in September was the smallest monthly rise in almost a year. The Bureau of Labor Statistics index of wholesale commodity prices remained fairly steady during October at about 117.7%. Their index of 22 selected commodities, most of which are raw materials, declined from 85.3 in the week of October 4, to 84.4% in the week of October 25. Thus it appears that the tight money policy of the Federal Reserve Board and deteriorating business conditions are finally slowing the recent round of inflation.

Continued price inflation in the face of adverse business developments has been one of the unusual characteristics of our 1957 economy. There are undoubtedly many explanations for this. One factor which helps explain this phenomenon is that throughout much of 1957 business reporters have too frequently been overly optimistic in the face of adverse business statistics. Thus a false sense of optimism was created over too long a period of time.

The early stages of a recession have now taken place. The degree and duration of this current business recession will be determined to a considerable extent by the actions taken by management, labor, government, and the consuming public in the weeks and months ahead.

Bank Debits

City	Bank Debits (Thousands of $'s) June '57	July '57	Aug. '57	Percent Change from Previous Year June '57	July '57	Aug. '57
Adrian	30,488	30,000	28,590	+24.2	+ 4.4	+ 4.6
Battle Creek	76,894	79,786	84,243	— .7	+ 8.5	+ 8.5
Bay City	55,312	57,043	61,102	+ 4.1	+ 4.5	+ 5.5
Detroit	6,258,079	6,412,234	6,866,113	+ 2.5	+ 7.5	+10.3
Flint	153,594	172,937	162,361	— 2.7	+16.7	+ 2.9
Grand Rapids	327,082	328,014	335,586	— 2.4	+ 3.8	+ .8
Jackson	88,775	99,545	97,154	+ 1.9	+14.2	+10.2
Kalamazoo	155,987	152,599	161.347	+ 2.2	+ 5.6	+ 5.4
Lansing	156,259	157,168	168,585	— 3.3	+10.4	+ 4.4
Muskegon	94,175	92,118	89,942	+ 1.4	+10.9	+ 2.5
Port Huron	41,770	44,184	46,362	— 5.5	+ 5.8	+ 5.5
Saginaw	125,574	126,718	135,559	+ 2.8	+ 4.2	+ 1.0
Escanaba	12,226	13,402	13,333	+ 3.0	+11.2	+10.9
Marquette	13,668	15,363	17,170	+ 5.9	+10.8	+15.7
Sault Ste. Marie	10,591	12,035	12,266	— 4.9	+ .5	— 1.6

Sources: Federal Reserve Banks of Chicago and Minneapolis and Board of Governors of the Federal Reserve System

Department Store Sales

City	July '57 Percent Change from June '57	July '56	August '57 Percent Change from July '57	Aug. '56	September '57 Percent Change from Aug. '57	Sept. '56	Percent Change 1957 vs. 1956
Battle Creek	—13	— 2	+24	+14	— 7	+ 4	+ 3
*Detroit	—16	+ 6	+28	+ 6	— 2	— 2	+ 2
*Flint	—13	— 8	+28	—11	— 6	—15	— 9
*Grand Rapids	—10	+ 1	+27	— 6	+ 4	— 4	— 6
*Jackson	—14	+ 6	+17	+ 2	— 3	— 1	— 2
*Kalamazoo	—19	— 2	+41	— 5	—19	—19	—10
*Lansing	—15	+ 4	+24	+ 6	+ 7	— 5	0
Muskegon	—17	— 3	+21	— 4	— 6	—12	— 6
Port Huron	—19	+ 1	+41	+ 9	— 7	—12	+ 5
*Saginaw	—10	— 2	+25	— 5	—10	— 9	— 4

*Metropolitan Areas

Source: Federal Reserve Bank of Chicago

Electric Sales in Kilowatt Hours

	Thousands of KWH Sales June '57	July '57	Aug. '57	Percent Change from Previous Year June '57	July '57	Aug. '57
Residential	560,008	547,058	535,949	+ 6.3	+ 8.0	+ 7.7
Commercial	328,442	346,117	347,766	+ 3.1	+ 5.6	+ 8.7
Industrial	879,402	910,895	933,558	+ 2.6	+18.4	+10.6

*Source: Edison Electric Institute

Motor Vehicle Factory Sales from Plants in U. S.

	Factory Sales July '57	Aug. '57	Sept. '57	Percent Change from Previous Year July '57	Aug. '57	Sept. '57
Passenger Cars	484,718	521,282	318,279	+12.8	+27.1	+57.4
Motor Trucks	94,924	89,150	62,087	+50.1	+29.6	+ 9.2
Motor Coaches	309	315	243	+40.4	—20.7	—33.2

Source: Automobile Manufacturers Association